

FORM PTO-1390
(REV. 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

041165/9023

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/937647

INTERNATIONAL APPLICATION NO.
PCT/EP00/02132INTERNATIONAL FILING DATE
10 March 2000 (10.03.00)PRIORITY DATE CLAIMED
31 March 1999 (31.03.99)TITLE OF INVENTION A STABILIZER COMBINATION FOR HALOGEN-CONTAINING
THERMOPLASTIC RESIN COMPOSITIONS

APPLICANT(S) FOR DO/EO/US

ROSENTHAL, Michael; KURZINGER, Alfred; REITH, Walter

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

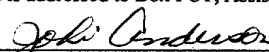
1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information:

Express Mail Label No. EL417144509US

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date of my signature and is addressed to Box PCT, Assistant Commissioner for Patents, Washington, D.C. 20231.


 Jodi Anderson

9-27-01

Date of Deposit

09/937647

PCT/EP00/02132

041165/9023

21. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):**

Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO. \$1000.00

International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO \$860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO
but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO
but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO
and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =**CALCULATIONS PTO USE ONLY**

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$
Total claims	13 - 20 =	0	x \$18.00	\$
Independent claims	1 - 3 =	0	x \$80.00	\$
MULTIPLE DEPENDENT CLAIM(S) (if applicable) 0			+ \$270.00	\$
TOTAL OF ABOVE CALCULATIONS =				\$ 860.00
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$
SUBTOTAL =				\$ 860.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$
TOTAL NATIONAL FEE =				\$ 860.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$
TOTAL FEES ENCLOSED =				\$ 860.00
				Amount to be refunded: \$
				charged: \$

a. ☒ A check in the amount of \$ 860.00 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-3080. A duplicate copy of this sheet is enclosed.d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Timothy M. Kelley
Michael Best & Friedrich LLP
100 East Wisconsin Avenue
Milwaukee, WI 53202-4108

SIGNATURE

Gregory J. Hartwig

NAME

46,761

REGISTRATION NUMBER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re

Patent Application of

Michael Rosenthal et al.

U.S. National Phase of
International Application No.
PCT/EP00/02132

International Filing Date:
10 March 2000

A STABILIZER COMBINATION FOR HALOGEN-CONTAINING THERMOPLASTIC
RESIN COMPOSITIONS

PRELIMINARY AMENDMENT

BOX PCT
Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Please amend the application as follows prior to calculation of the filing fees and prior to examination of the application.

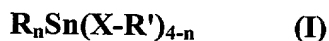
IN THE CLAIMS:

Please cancel claims 1-13 without prejudice and substitute claims 14-26 therefor in the application.

14. A stabilizer combination for halogen-containing thermoplastic resins, comprising:

a) calcium oxide and/or calcium hydroxide, where these, where appropriate, may have been surface-modified, and have a particle size of not more than 200 μm ;

b) at least one tin compound of the general formula (I)



Where

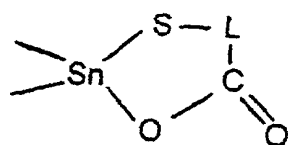
n is 1 or 2;

each of the groups R, which may be identical or different, is a straight-chain or branched alkyl group having from 1 to 22 carbon atoms;

each of the groups X, which may be identical or different, is -S- or -O-; and

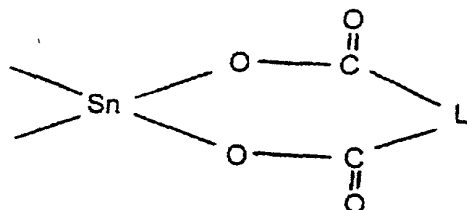
each of the groups R', which may be identical or different, is a straight-chain or branched alkyl group having from 1 to 22 carbon atoms, or a $-\text{[C(O)]}_m\text{-L-C(O)-O-R''}$ group or a $-\text{[C(O)]}_m\text{-L-O-C(O)-R''}$ group, where m is 0 or 1, -L- is a divalent connecting group which is selected from alkylene groups having from 1 to 4 carbon atoms, or a vinylene group, and R'' is an alkyl group having from 1 to 22 carbon atoms; or

two (X-R') groups may have bonding to one another to form a heterocyclic ring of the formula (I') or (I'')



(I')

or



(I'')

where L is as defined above; and

c) at least one zinc compound selected from liquid and solid zinc salts of saturated, unsaturated, straight-chain, or branched mono- or polyfunctional aromatic or aliphatic carboxylic acids, zinc oxide and zinc hydroxide;

with the proviso that no perchlorate is present in the stabilizer combination.

15. A stabilizer combination as claimed in claim 14, wherein the amount of component (a) present is from 0.1 to 5 parts by weight.

16. A stabilizer combination as claimed in claim 14, wherein component (b) is at least one tin compound of the formula (I), where R is an alkyl group having from 1 to 8 carbon atoms.

17. A stabilizer combination as claimed in claim 14, characterized in that component (b) is at least one tin compound of the formula (I), where R' is an alkyl group having from 8 to 18 carbon atoms, or a $-\text{[C(O)]}_m\text{-L-C(O)-O-R''}$ group or a $-\text{[C(O)]}_m\text{-L-O-C(O)-R''}$ group, where -L- is a methylene, ethylene, or vinylene group, and R'' is an alkyl group having from 6 to 12 carbon atoms.

18. A stabilizer combination as claimed in claim 14, characterized in that component (b) is at least one tin compound of the formula (I), where two (X-R') groups have bonding to one another to form a heterocyclic ring of the formula (I') or (I''), where -L- is an ethylene group or a vinylene group.

19. A stabilizer combination according to claim 14, characterized in that the amount of component (b) present is from 0.1 - 3 parts by weight.

20. A stabilizer combination according to claim 14, characterized in that component (c) is a zinc salt of a saturated aliphatic carboxylic acid having from 10 to 18 carbon atoms.

21. A stabilizer combination as claimed in claim 14, characterized in that the amount of component (c) present is from 0.1 to 3 parts by weight.

22. A thermoplastic resin composition, comprising at least one halogen-containing thermoplastic resin and a stabilizer combination according to claim 14.

23. A thermoplastic resin composition according to claim 22, characterized in that the halogen-containing thermoplastic resin is polyvinyl chloride.

24. The use of the stabilizer combination according to claim 14 for stabilizing halogen-containing thermoplastic resins.

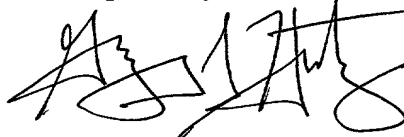
25. The use according to claim 24 for stabilizing polyvinyl chloride (PVC).

26. The use according to claim 25 for stabilizing rigid PVC (UPVC).

CONCLUSION

Entry of the above amendments before the application is examined is respectfully requested.

Respectfully submitted,



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A stabilizer combination for halogen-containing
thermoplastic resin compositions

5 The present invention relates to a stabilizer
combination for weathering-resistant halogen-containing
thermoplastic resin compositions, in particular those
based on polyvinyl chloride (PVC), and encompassing
calcium chloride and/or calcium oxide, surface-modified
10 where appropriate, an organotin compound and a zinc
compound.

Halogen-containing polymers are subject to chemical
degradation reactions resulting from exposure to
15 electromagnetic radiation and/or heat, and these can
lead to lasting impairment of performance
characteristics, or lead to problems at an earlier
stage, during processing. In particular, PVC moldings
have a tendency toward degradation reactions brought
20 about by heat, water, or electromagnetic radiation, and
leading to impairment of properties, especially of
color. A long-standing practice has been to incorporate
what are known as stabilizers into these thermoplastic
polymer compositions, to inhibit these undesirable
25 degradation reactions of the polymer chains.

When producing moldings from rigid PVC (UPVC), for
example window profiles, technical profiles, pipes, or
sheets, it is usual to use heavy-metal-containing
30 stabilizers, since high requirements are placed upon
these moldings and these stabilizers are highly
effective. Since there is currently discussion
concerning the safety-at-work and environmental aspects
of heavy metals such as lead and cadmium, attempts are
35 being made to increase the extent to which these
stabilizers are replaced by stabilizer systems based on
calcium compounds or on zinc compounds and presenting
no physiological hazard. Good results can be achieved
with these calcium compounds and zinc compounds if they

are used together with suitable additives, such as hydrotalcites, zeolites, hydrocalumites, polyols, diketones, aminouracils, cyanurates, or esters of phosphorous acid.

5

DE-A-2935689 describes calcium hydroxide as a stabilizer component for plasticized PVC (PPVC), another essential stabilizer component needed here being at least one phenolic antioxidant. EP-B-0394547
10 discloses the combination of overbased alkaline earth metal carboxylates with zeolite, calcium hydroxide, and perchlorates. However, the combination described there is only suitable for use in PPVC for the indoor sector. This also applies to the stabilizers described in DE-A-
15 4031401. DD-A-298799 describes a combination of zinc soaps with various finely dispersed calcium compounds which are coated with calcium stearate, as a stabilizer for plasticized PVC.

20 Alongside stabilizer systems based on lead and calcium/zinc, it has long been known that organotin compounds may be used. An example described in US-A-5,739,118 is a stabilizer combination of organotin compounds with phosphorus-containing compounds, and US-
25 A-5,518,662 describes a mixture of methyl- and butyltin compounds, and US-A-3,933,743 describes various organotin compounds with low tin content. The compounds used are mostly liquid sulfur-containing organotin compounds. These substances have a strong intrinsic
30 odor, and complicated ventilation measures have to be implemented at all stages of preparation and processing. A disadvantage with the use of these organotin compounds is that, compared with systems based on lead or calcium/zinc, they give less
35 weathering resistance. Attempts have been made to compensate for this disadvantage by using a markedly increased concentration of pigment. The highly abrasive nature of the titanium dioxide grades usually used as

pigments means that increased wear is found on machinery and tooling.

It is an object of the invention to provide a stabilizer combination for halogen-containing thermoplastic resins which, when compared with the known formulations, gives higher thermal stability and is preferably suitable for use in UPVC for the outdoor sector.

According to the invention, this object is achieved by way of a stabilizer combination for halogen-containing thermoplastic resins, encompassing:

a) calcium oxide and/or calcium hydroxide, where these may, where appropriate, have been surface-modified;

b) at least one tin compound of the general formula (I)



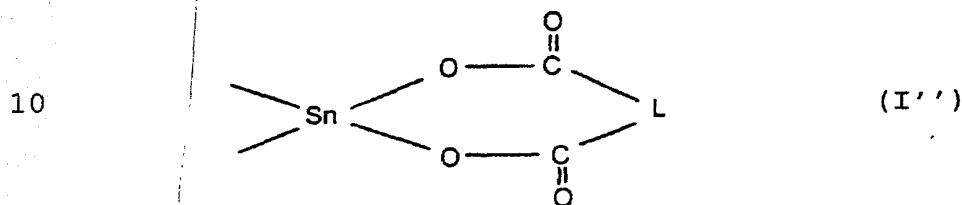
where n is 1 or 2;

each of the groups R, which may be identical or different, is a straight-chain or branched alkyl group having from 1 to 22 carbon atoms;

each of the groups X, which may be identical or different, is -S- or -O-; and

each of the groups R', which may be identical or different, is a straight-chain or branched alkyl group having from 1 to 22 carbon atoms, or a $-[C(O)]_m-L-C(O)-O-R''$ group or a $-[C(O)]_m-L-O-C(O)-R''$ group, where m is 0 or 1, -L- is a divalent connecting group which is selected from alkylene groups having from 1 to 4 carbon atoms, or a vinylene group, and R'' is an alkyl group having from 1 to 22 carbon atoms; or

two (X-R') groups may have bonding to one another to form a heterocyclic ring of the formula (I') or (I'')



15 where L is as defined above; and

20 c) at least one zinc compound selected from liquid and solid zinc salts of saturated, unsaturated, straight-chain, or branched mono- or polyfunctional aromatic or aliphatic carboxylic acids, zinc oxide and zinc hydroxide;

with the proviso that no perchlorate is present in the stabilizer combination.

25

The present invention also provides a thermoplastic resin composition which comprises at least one halogen-containing thermoplastic resin and the stabilizer combination of the invention.

30

The invention is described in more detail below with reference to preferred embodiments.

35

The calcium hydroxide and/or calcium oxide used as component (a) in the stabilizer combination of the invention preferably has a particle size of not more than 200 μm , in particular from 1 to 20 μm , determined by laser diffraction, method Bärlocher malve-01. The calcium hydroxide and/or calcium oxide may, where

appropriate, have been surface-modified. The surface modification may take place by known processes and using conventional coating agents. Preferred coating agents are fatty acids.

5

The amount of component (a) in the stabilizer combination of the invention is preferably from 0.1 - 5 parts by weight, in particular from 0.2 - 2 parts by weight.

10

Preferred tin compounds used as component (b) of the stabilizer combination of the invention and having the general formula (I) are described below:

15

R in the formula (I) is preferably an alkyl group having from 1 to 8 carbon atoms, particularly preferably a straight-chain alkyl group, such as a methyl, ethyl, n-propyl, n-butyl, or n-octyl group.

20

In one preferred embodiment of the invention, R' in the general formula (I) is preferably an alkyl group having from 8 to 18 carbon atoms, or a $-[C(O)]_m-L-C(O)-O-R''$ group or a $-[C(O)]_m-L-O-C(O)-R''$ group, where -L- is a methylene, ethylene, or vinylene group, and R'' is an

25

alkyl group having from 6 to 12 carbon atoms. R' [prime] is particularly preferably a straight-chain alkyl group, such as an n-hexyl, n-heptyl, n-octyl, n-nonyl, n-decyl, n-undecyl, or n-dodecyl group.

30

In another preferred embodiment of the invention, two (X-R') groups have bonding to one another to form a heterocyclic ring of the formula (I') or (I''), where -L- is an ethylene group or a vinylene group.

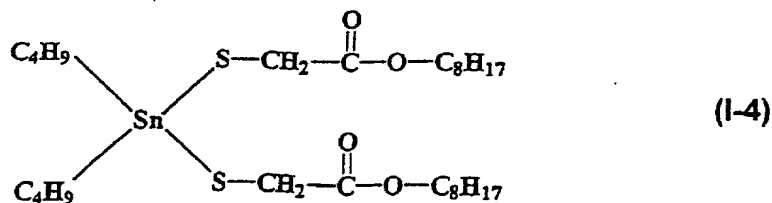
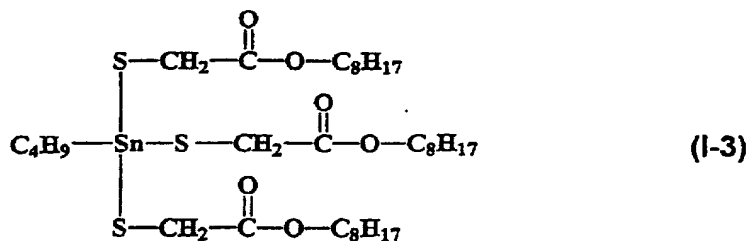
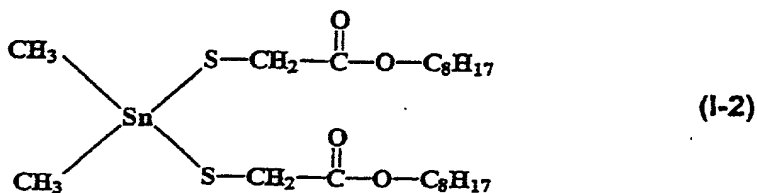
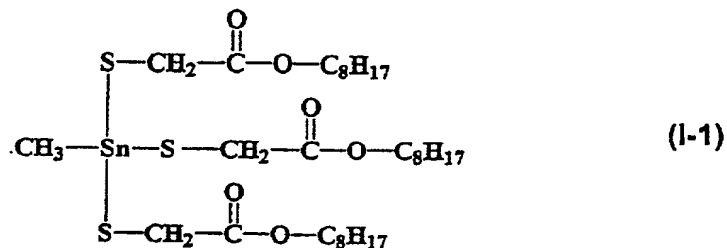
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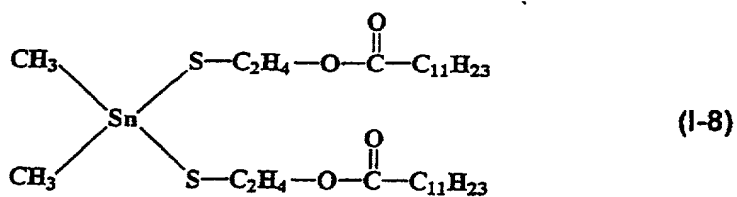
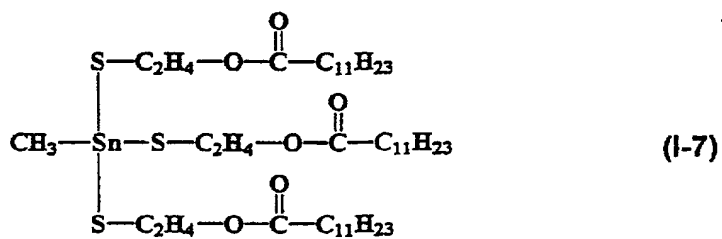
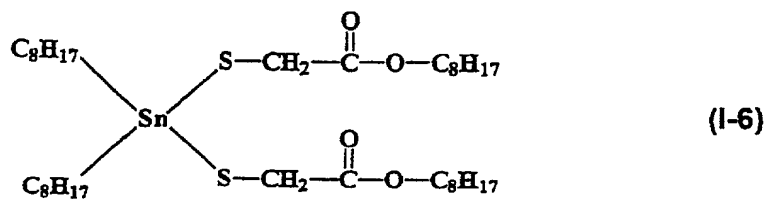
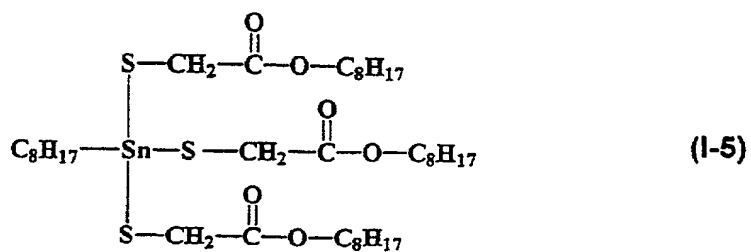
Preferred examples of tin compounds of the formula (I) are methyltin trithioglycolate, dimethyltin dithioglycolate, n-butyltin trithioglycolate, di-n-butyltin dithioglycolate, n-octyltin trithioglycolate, di-n-octyltin dithioglycolate, reverse methyltin

trithioesters, reverse dimethyltin dithioesters, di-n-butyltin thiopropionate, di-n-butyltin maleate, di-n-butyltin dimaleate, di-n-octyltin dimaleate, and di-n-butyltin dimercaptides.

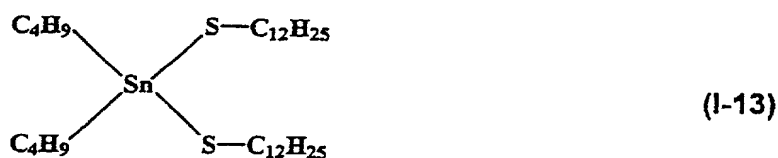
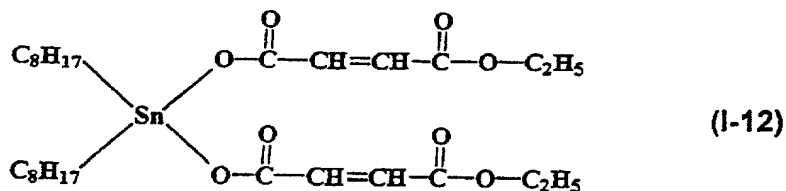
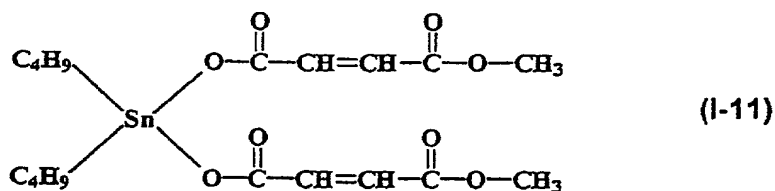
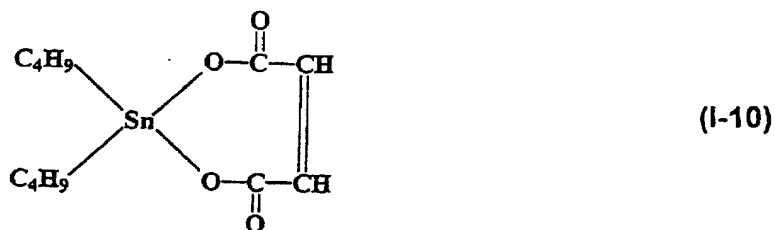
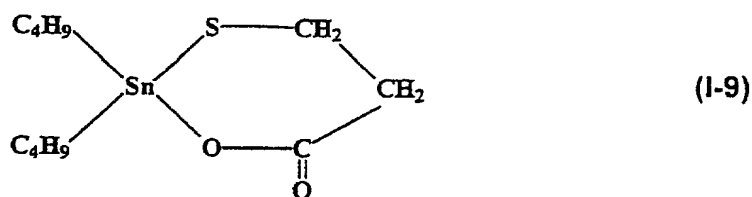
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Particularly preferred tin compounds of the formula (I) are:





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5 The amount of component (b) present in the stabilizer combination of the invention is preferably from 0.1 - 3 parts by weight, in particular from 0.2 - 2 parts by weight.

10 Component (c) of the stabilizer combination of the invention is at least one zinc compound selected from liquid and solid zinc salts of saturated, unsaturated,

straight-chain, or branched, mono- or polyfunctional, aromatic or aliphatic carboxylic acids, zinc oxide, and zinc hydroxide. The component (c) used preferably comprises a zinc salt of a saturated aliphatic carboxylic acid having from 10 to 18 carbon atoms. Examples of these encompass zinc laurate and zinc stearate.

The amount of component (c) present in the stabilizer combination of the invention is preferably from 0.1 - 3 parts by weight, in particular from 0.5 - 1.5 parts by weight.

The amount used of the stabilizer combination of the invention is preferably from 0.8 to 5.5 parts by weight, in particular from 1.1 to 5.5 parts by weight, based on 100 parts by weight of the halogen-containing thermoplastic resin.

The halogen-containing thermoplastic resin for which the stabilizer combination of the invention is preferably used is polyvinyl chloride (PVC).

The term polyvinyl chloride used in the present specification encompasses commonly used homo- and copolymers of vinyl chloride, and also blends of polyvinyl chloride compounds of this type with other polymer compositions. Polymers of this type may have been prepared in any desired manner, for example by suspension, emulsion, or block polymerization. Examples of their K value are from 50 to 100.

It has been found that the use of a stabilizer combination of the invention permits the production of UPVC moldings which have unexpectedly high heat resistance combined with excellent weathering resistance, for use in outdoor applications.

Besides the abovementioned components (a), (b), and (c), the stabilizer combination of the invention may also comprise other constituents. Preferred examples of other constituents encompass:

(d) basic calcium aluminum hydroxyphosphites of the general formula (II)



where

$$\frac{2x + 5}{2} > y > 0 \quad \text{and}$$

$$0 \leq m \leq 12.$$

Compounds of the general formula (II) are described by way of example in DE 4106411.

(e) Basic calcium aluminum hydroxycarboxylates of the general formula (III)



where

$$2 \leq x \leq 12,$$

$$\frac{2x + 5}{2} > y > 0,$$

$$0 \leq m \leq 12, \text{ and}$$

$$1 \leq n \leq 8, \text{ and}$$

A^{n-} is an aliphatic saturated, unsaturated, straight-chain or branched, monofunctional or polyfunctional carboxylic anion having from 1 to 22 carbon atoms, or

an aromatic or heteroaromatic mono- or polyfunctional carboxylic anion having from 6 to 20 carbon atoms.

The carboxylic anion A^{n-} of the general formula (III) may be selected from anions of malonic, succinic, adipic, fumaric, maleic, phthalic, isophthalic, terephthalic, pyridinic, benzoic, salicylic, tartronic, malic, tartaric, acetonedicarboxylic, oxoacetic, aconitic, and citric acid, for example. Preference is given to the anions of fumaric and phthalic acid, and use is particularly made of fumarates.

Compounds of the general formula (III) are known from DE 4106404.

(f) Polyols and/or disaccharide alcohols, such as trimethylolpropane, ditrimethylolpropane, pentaerythritol, dipentaerythritol, tripentaerythritol, polyvinyl alcohol, maltitol, isomaltitol, sorbitol, mannitol, lactitol, glycerol, diglycerol.

(g) Epoxy compounds based on vegetable or animal oils, for example epoxidized soy oil or rapeseed oil, epoxidized fatty esters, epoxidized glycidyl ethers, glycidyl acrylate, glycidyl methacrylate, their polymers and copolymers, and epoxidized polymers, such as epoxidized polybutadiene and epoxidized ABS.

(h) Linear or cyclic β -ketoesters and/or β -diketones and/or triketones and/or their metal salts.

(i) Hydrotalcites, for example as described in DE 4425266, EP 0189899, DE 3843581, US 4,883,533, EP 0407139, DE 4031818, DE 4110835, DE 4117034, EP 0522810, DE 4439934 and US 5,352,723.

(j) Zeolites such as those described by the general formula $M_x^n[(AlO_2)_x(SiO_2)_y] \cdot m H_2O$, where n is the charge on the cation M and $n = 1$ or 2 , and M is an alkali

metal or alkaline earth metal, and $0.8 \leq x$; $y \leq 15$, and $0 \leq m \leq 300$.

5 (k) Amino compounds, for example those selected from sterically hindered amines (HALS), aminocrotonic acid compounds, uracils, amino acids, and their alkali metal and alkaline earth metal salts.

10 (l) Hydrocalumites of the general formula $\text{AlCa}_x(\text{OH})_{(2x+3)} \cdot m \text{H}_2\text{O}$; $x = 1-4$; $m = 0-8$, for example as described in DE-A-4103881.

15 (m) Alkaline earth metal salts of saturated, unsaturated, straight-chain, or branched mono- or polyfunctional aromatic or aliphatic carboxylic acids.

20 The stabilizer combination of the invention may in addition comprise at least one lubricant. Examples of lubricants are those selected from paraffin waxes, polyethylene waxes, polypropylene waxes, ester lubricants, mono- and/or polyvalent alcohols, mono- and/or polycarboxylic acids, amide waxes, and oxidized polyethylene waxes. Lubricants are selected to meet rheological requirements.

25 The stabilizer combination of the invention may be in any desired physical form, e.g. as a pulverulent mixture, compressed pellets, sprayed pellets, or micropellets, or flakes or pastilles. These forms of
30 the products may either be pelletized from pulverulent mixtures by pressure and/or heat, and/or by adding pelletizing auxiliaries, or be molded by cooling or spraying melts of the composition of the invention, to give flakes, pastilles, or prill. To prepare halogen-
35 containing resin compositions, the individual substances may be added directly or as a mixture, in the abovementioned forms of the product, prior to or during processing.

The halogen-containing thermoplastic resin composition may then be molded in a manner known per se to give moldings.

5 The stabilizer combination of the invention may be used in combination with the additives usually used, for example fillers (e.g. chalk), pigments (e.g. titanium dioxide, zinc sulfide), flame retardants (e.g. magnesium hydroxide, aluminum hydroxide, antimony trioxide), reinforcing materials (e.g. glass fibers, talk, vegetable fibers), and plasticizers (e.g. phthalate, phosphate, and/or polymeric plasticizers, chloroparaffins) in the production of thermoplastic molding compositions.

15 The examples described below in mixing specification tables A and B illustrate the invention but do not restrict the same. Thermal stability in the examples is determined to DIN VDE 0472 Part 614 (HCl value). The
20 aim here is to achieve the highest possible value. Weathering resistance is evaluated by measuring the b value (CIE-LAB system) after 24 months of open-air weathering in the south of France. The profiles had undergone some further darkening while in the mail for
25 a number of days and were then subjected to seven further days of open-air weathering in Munich. To indicate good weathering resistance here the b value should be as low as possible, pointing to only slight yellow discoloration.

30

Processing:

The constituents of the mixing specification were mixed with the PVC and with other additives in a
35 heating/cooling mixer until the mixing temperature reached 120°C, then cooled to 40°C. The resultant dry blend was then extruded to give profiles.

Example A

	A1*	A2*	A3*	A4	A5	A6*	A7*	A8*	A9	A10
SPVC	100	100	100	100	100	100	100	100	100	100
Chalk ¹⁾	5	5	5	5	5	5	5	5	5	5
Impact modifier ²⁾	7	7	7	7	7	7	7	7	7	7
TiO ₂ ³⁾	5	5	5	5	5	5	5	5	5	5
Flow promoter ⁴⁾	1	1	1	1	1	1	1	1	1	1
Paraffin wax	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Oxidized PE wax	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Calcium stearate ⁵⁾	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Zinc stearate ⁶⁾	--	--	--	0.25	0.5	--	--	--	0.25	0.5
Calcium hydroxide	--	0.5	1.0	0.25	0.5	--	0.5	1.0	0.25	0.5
Tin stabilizer ⁷⁾	1.5	1.0	0.5	1.0	0.5	--	--	--	--	--
Tin stabilizer ⁸⁾	--	--	--	--	--	1.5	1	0.5	1.0	0.5

* Comparative examples

- 5 1) Hydrocarb 95 T (Omya trade name)
- 2) Bärödur E-ST 3 (Bärlocher trade name)
- 3) TiPure R 101 (DuPont trade name)
- 4) Bärörapid 10 F (Bärlocher trade name)
- 5) Ceasit 1 (Bärlocher trade name)
- 10 6) Zinkum 5 (Bärlocher trade name)
- 7) Advastab TM 181 (Morton trade name)
- 8) Bärostab M 25 S (Bärlocher trade name)

Table 1 shows the b values after weathering

15

20

Table 1

Specimen	b-value
A1	7.2
A2	7.5
A3	7.7
A4	4.6
A5	4.1
A6	7.1
A7	7.6
A8	8.0
A9	4.3
A10	3.9

It is clear that the mixtures A4 - A5 and A9 - A10 of
5 the invention gave markedly lower values.

Example B

	B1*	B2	B3
SPVC	100	100	100
Chalk ¹⁾	3	3	3
Impact modifier ⁹⁾	7	7	7
TiO ₂ ¹⁰⁾	4.2	4.2	4.2
Flow promoter ¹¹⁾	1	1	1
Paraffin wax	0.75	0.75	0.75
Oxidized PE wax	0.15	0.15	0.15
Calcium stearate	1.5	0.5	1.0
Zinc stearate ⁶⁾	--	1.0	0.5
Calcium hydroxide	--	1.0	1.0
Tin stabilizer ¹²⁾	1.5	0.5	1.0

10 * Comparative example

⁹⁾ Bärodur EST4 (Bärlocher trade name)

¹⁰⁾ Kronos 2220 (Kronos trade name)

¹¹⁾ Bärorapid (Bärlocher trade name)

¹²⁾ Bärstab MSO (Bärlocher trade name)

Table 2 shows the HCl values to DIN VDE 0472 Part 614

Table 2

Specimen	HCl value (min)
B1	22
B2	32
B3	30

5

It is clear that the mixtures B2 and B3 of the invention gave markedly higher values.

PCT/EP00/02132
Bärlocher GmbH
PCT1147-00936/co
September 6, 2000

New patent claims 1 to 13

1. A stabilizer combination for halogen-containing thermoplastic resins, encompassing:

a) calcium oxide and/or calcium hydroxide, where these, where appropriate, may have been surface-modified, and have a particle size of not more than 200 μm ;

b) at least one tin compound of the general formula (I)



where

n is 1 or 2;

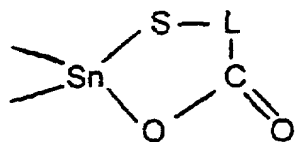
each of the groups R, which may be identical or different, is a straight-chain or branched alkyl group having from 1 to 22 carbon atoms;

each of the groups X, which may be identical or different, is -S- or -O-; and

each of the groups R', which may be identical or different, is a straight-chain or branched alkyl group having from 1 to 22 carbon atoms, or a $-\text{[C(O)]}_m\text{-L-C(O)-O-R''}$ group or a $-\text{[C(O)]}_m\text{-L-O-C(O)-R''}$ group, where m is 0 or 1, -L- is a divalent connecting group which is selected from alkylene groups having from 1 to 4 carbon atoms, or a vinylene group, and R'' is an alkyl group having from 1 to 22 carbon atoms; or

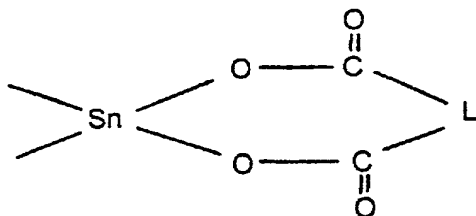
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two (X-R') groups may have bonding to one another to form a heterocyclic ring of the formula (I') or (I'')



(I')

or



(I'')

where L is as defined above; and

c) at least one zinc compound selected from liquid and solid zinc salts of saturated, unsaturated, straight-chain, or branched mono- or polyfunctional aromatic or aliphatic carboxylic acids, zinc oxide and zinc hydroxide;

with the proviso that no perchlorate is present in the stabilizer combination.

2. A stabilizer combination as claimed in claim 1, wherein the amount of component (a) present is from 0.1 to 5 parts by weight.

3. A stabilizer combination as claimed in either of claims 1 and 2, wherein component (b) is at least one tin compound of the formula (I), where R is an alkyl group having from 1 to 8 carbon atoms.

4. A stabilizer combination as claimed in any of claims 1 to 3, characterized in that component (b) is at least

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one tin compound of the formula (I), where R' is an alkyl group having from 8 to 18 carbon atoms, or a $-[C(O)]_m-L-C(O)-O-R''$ group or a $-[C(O)]_m-L-O-C(O)-R''$ group, where -L- is a methylene, ethylene, or vinylene group, and R'' is an alkyl group having from 6 to 12 carbon atoms.

5. A stabilizer combination as claimed in any of claims 1 to 3, characterized in that component (b) is at least one tin compound of the formula (I), where two (X-R') groups have bonding to one another to form a heterocyclic ring of the formula (I') or (I''), where -L- is an ethylene group or a vinylene group.

6. A stabilizer combination according to any of claims 1 to 5, characterized in that the amount of component (b) present is from 0.1 - 3 parts by weight.

7. A stabilizer combination according to any of claims 1 to 6, characterized in that component (c) is a zinc salt of a saturated aliphatic carboxylic acid having from 10 to 18 carbon atoms.

8. A stabilizer combination as claimed in any of claims 1 to 7, characterized in that the amount of component (c) present is from 0.1 to 3 parts by weight.

9. A thermoplastic resin composition, comprising at least one halogen-containing thermoplastic resin and a stabilizer combination according to any of claims 1 to 8.

10. A thermoplastic resin composition according to claim 9, characterized in that the halogen-containing thermoplastic resin is polyvinyl chloride.

11. The use of the stabilizer combination according to any of claims 1 to 8 for stabilizing halogen-containing thermoplastic resins.

12. The use according to claim 11 for stabilizing polyvinyl chloride (PVC).

13. The use according to claim 12 for stabilizing rigid PVC (UPVC).

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Declaration and Power of Attorney For Patent Application

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled A STABILIZER COMBINATION FOR HALOGEN-CONTAINING THERMOPLASTIC RESIN COMPOSITIONS (Attorney Docket No. 041165-9023-00), the specification of which was filed with my authority, on March 10, 2000 as International Application No. PCT/EP00/02132.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims referred to above.

I acknowledge the duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

And I hereby appoint Timothy M. Kelley (Reg. No. 34,201), John C. Bigler (Reg. No. 29,513), Glenn M. Massina (Reg. No. 40,081), Leon Nigohosian, Jr. (Reg. No. 39,791), Mark A. Ussai (Reg. No. 42,195), Christopher B. Austin (Reg. No. 41,592), David L. De Bruin (Reg. No. 35,489), Gerald L. Fellows (Reg. No. 36,133), Joseph A. Gemignani (Reg. No. 19,482), Gregory J. Hartwig (Reg. No. 46,761), Daniel S. Jones (Reg. No. 42,697), Richard L. Kaiser (Reg. No. 46,158), Casimir F. Laska (Reg. No. 30,862), Edward R. Lawson Jr. (Reg. No. 41,931), Craig J. Loest (Reg. No. 48,557), Richard H. Marschall (Reg. No. 39,290), Thomas A. Miller (Reg. No. 36,874), Kevin P. Moran (Reg. No. 37,193), Thomas J. Otterlee (Reg. No. 48,652), David R. Price (Reg. No. 31,557), Thomas S. Reynolds II (Reg. No. 45,262), Raye L. Shaffer (Reg. No. 47,933), Chad W. Shea (Reg. No. 48,470), Billie Jean Smith (Reg. No. 36,940), David B. Smith (Reg. No. 27,595), Derek C. Stettner (Reg. No. 37,945), Donald W. Walk (Reg. No. 29,118), Glen A. Weitzer (Reg. No. 48,337), Sheldon L. Wolfe (Reg. No. 43,996), Jill A. Fahrlander (Reg. No. 42,518), Grady J. Frenchick (Reg. No. 29,018), Jeffrey D. Peterson (Reg. No. 49,038), Sara Vinarov (Reg. No. 48,524), Jeffrey S. Ward (Reg. No. 32,774), Teresa J. Welch (Reg. No. 33,049), Charlene L. Yager (Reg. No. 48,887), Michael Best & Friedrich LLP; and Louis Altman (Reg. No. 19,373), Robert S. Beiser (Reg. No. 28,687), Lisa C. Childs (Reg. No. 39,937), Charles A. Laff (Reg. No. 19,787), William A. Meunier (Reg. No. 41,193), Larry L. Saret (Reg. No. 27,674), Martin L. Stern (Reg. No. 28,911), Barry W. Sufrin (Reg. No. 27,398), Marshall W. Sutker (Reg. No. 19,995), Sean S. Swidler (Reg. No. 49,033), Kevin C. Trock (Reg. No. 37,745), J. Warren Whitesel (Reg. No. 16,830), Jane Wright-Mitchell (Reg. No. 47,187), Michael Best & Friedrich LLC, and each or any of them, my attorneys or agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

1 15:30 VON: PA. GRUNECKER. AUSLAND KEN+48 89 220287 SE11

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I hereby claim foreign priority benefits under Title 35, United States Code, §119 of the foreign application for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application

19914798.1
(Number)

Germany
(Country)

31 March 1999
(Day/Month/Year Filed)

206270 44946660

The undersigned to this Declaration and Power of Attorney hereby authorize the U.S. attorneys named herein to accept and follow instructions from Grunecker, Kinkeldey, Stockmair & Schwanhaussen, Germany as to any actions to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and the undersigned. In the event of a change in the person(s) from whom instructions may be taken, the undersigned will so notify the U.S. attorneys.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.


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110
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